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ABSTRACT

This document consists of summaries of six closely-related studies which investigated empirically the determinants of children's health with particular reference to home and local environmental variables. The first study examined the relationship between a number of family characteristics and the health of white children (6 through 11 years of age) from 1963 to 1965. The second study explored race and income differences in the health of these children. The third study investigated the health of white adolescents (12 to 17 years of age) from 1966 to 1970. The fourth study examined the environmental contribution of family background, in general, and parents' schooling and family income, in particular, to the health of adolescents. The fifth and sixth studies investigated relationships among children's growth, diet, and family background. Results of all studies indicated that 1) home environment, in general, and mother's schooling, in particular, were important determinants of children's health; 2) preventive dental check-ups within the past year and exposure to fluoridated water improved the oral health of youths but little evidence accrued to show that preventive medical check-ups were efficacious to the physical health of youths; 3) income and race differences did not significantly affect children's health; and 4) family income and parents' schooling were significantly related to the nutrient intake (in proteins and calories) of young children. It is suggested that these findings highlight the necessity of explicitly recognizing the multidimensional nature of health. (Author/MP)

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DETERMINANTS OF CHILDREN'S HEALTH

Executive Summary, Grant Number 1 R01 HS 02917
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Objective

The objective of this research is to investigate empirically the determinants of children's health with particular reference to home and local environmental variables. Home environmental factors include basic family background variables such as parents' schooling, family income, family size, and mother's labor force status. They also include mechanisms via which background variables operate such as preventive medical care and nutrition. Local environmental factors include health manpower availability, public provision of fluoridated water, climate, and air pollution.

Wherever possible, we study children's health in the context of the nature-nurture controversy. Despite the existence of a massive (but inconclusive) literature on the relative importance of heredity (nature) and the home and school environment (nurture) in the determination of cognitive development, the corresponding issue has not been directly addressed by researchers in child and adolescent health. This is partly because much of the health research is limited either to poverty or to minority populations and partly because researchers who use representative samples do not adopt the multivariate context necessary for distinguishing between genetic and environmental influences. Our research uses multivariate statistical techniques to provide some evidence of the degree to which nurture--that is, the family and local environment, acts in determining the health levels of representative samples of children and adolescents.

Methods of Procedure

Our research consists of six closely-related studies. In the first study we examine the relationship between a number of family characteristics and the health of white children aged 6 through 11 years in the period 1963 through 1965. The data set employed is Cycle II of the U.S. Health Examination Survey (HES II). Our aim in Chapter 2 is to paint a complete picture of the health of this childhood cohort. Therefore, a variety of health measures from physical examinations by pediatricians and dentists and from interviews with parents and school officials are analyzed. In the second study we explore race and income differences in the health of children in the Cycle II data set. We compare such differences in mid-childhood to race and income differences in infant mortality and birth weight.

In the third study we investigate the health of white adolescents aged 12 through 17 years in the 1966-70 period. The data set employed is Cycle III of the Health Examination Survey. Our research in this study focuses on the nature-nurture controversy by examining in detail the impacts of four important components of the home and local environment: family background, preventive medical care, health manpower

specific to the youth's county of residence (the number of pediatricians per capita and the number of dentists per capita), and information on the presence of controlled or natural fluorides in the water supply system that services the youth's community. Four specific health indicators are studied: oral health, obesity, anemia, and corrected distance vision. These indicators are chosen because they represent health problems that are capable of being affected by family decisions concerning diet and other forms of at-home health care, as well as by pediatric and dental care.

Two types of relationships are estimated: a health production function and a derived demand function for preventive care. The resulting estimates permit us to answer the following questions. What is the size of the home environmental effect on adolescent oral and physical (obesity, anemia, corrected distance vision) health outcomes? How important is the home environment as a determinant of the demand for preventive dental and pediatric care? How large are the effects of dentists, preventive care, and fluoridation on oral health outcomes? How large are the effects of pediatricians and preventive pediatric care on physical health outcomes? In addressing the last two questions, we recognize explicitly the common-sense proposition that an increase in a community's physician or dental manpower will not increase health outcomes unless it encourages more utilization of medical care services. Note that we could not study relationships among preventive medical care, health manpower, and health outcomes in Cycle II of the HES because there are no measures of preventive care in Cycle II.

In the fourth study we shift from cross-sectional to panel data to shed further light on the pure environmental contribution of family background in general and parents' schooling and family income in particular to the health of adolescents. We also examine whether health causes cognitive development, cognitive development causes health, or both cause each other. The sample consists of the adolescents in Cycle III of the HES who were also examined in Cycle II when they were children. This panel data set contains measures of health and cognitive development in adolescence, corresponding measures in childhood, and family background variables.

To study the dynamics of health and cognitive development and to deal with the problem of simultaneity, we investigate the causal prior-ness of these measures. Specifically, we assume that the processes that generate them are Markov and can be estimated by a simple first-order ARMA model. We show that, if the genetic impact on these variables is restricted to the determination of initial conditions, then the estimates of the time paths will be free of genetics-bias and will reflect the true environmental effects of family background variables. Empirically, we estimate two multivariate equations: one relating adolescent health to childhood health, childhood cognitive development, and family background; and a second relating adolescent cognitive development to

childhood cognitive development, childhood health, and family background. In the health equation, the coefficient of family background gives an estimate of the environmental effect that controls for the initial or inherited level of health. The coefficient of childhood cognitive development indicates whether the latter variable causes adolescent health. The adolescent cognitive development equation can be interpreted in a similar manner. In particular, the coefficient of childhood health measures the significance and size of the causal relationships from health to cognitive development.

In the fifth and sixth studies we investigate relationships among children's growth, diet, and family background. The growth measures are height, weight, and head circumference. The diet measures are intakes of calories and proteins. The fifth study is based on infants and young children between the ages of zero and 36 months in the 1968-70 period who were members of the Ten State Nutrition Survey (TSNS). The sixth study is based on children aged 1 through 5 in the 1971-75 period who were members of Cycle I of the Health and Nutrition Examination Survey (HANES I). Three types of empirical results are presented. These are (1) descriptive statistics of variables in the TSNS and in HANES I that are important in an analysis of children's diet and growth; (2) ordinary least squares multiple regressions in which diet or growth are dependent variables and exogenous child and family characteristics are independent variables; and (3) two-stage least squares estimates of a structural model in which diet and growth are determined simultaneously.

Summary of Findings

Our most important findings pertain to the nature-nurture controversy; the impacts of preventive care and health manpower; income and race differences in children's health, the multidimensional nature of children's health and relationships among growth, diet, and family background. These findings are highlighted below.

1. Nature-Nurture Controversy

The home environment in general and mother's schooling in particular play an extremely important role in the determination of children's health. It is not surprising to find that a child's home environment has a positive impact on his health with no other variables held constant. Moreover, it is difficult to sort out the effect of nature from that of nurture because it is difficult to measure a child's genetic endowment and because genetic differences may induce environmental changes. Nevertheless, we have accumulated a number of suggestive pieces of evidence on the true importance of the home environment. With birth weight, mother's age at birth, congenital abnormalities, other proxies for genetic endowment, and family income held constant, parents' schooling has positive and statistically significant effects on many

measures of health in childhood and adolescence. Children and teenagers of more educated mothers have better oral health, are less likely to be obese, and less likely to have anemia than children of less educated mothers. Father's schooling plays a much less important role in the determination of oral health, obesity and anemia than mother's schooling. The latter findings are important because equal effects would be expected if the schooling variables were simply proxies for unmeasured genetic endowments. Moreover, they are especially strong results because oral health, anemia, and obesity reflect health measures that can be modified by inputs of medical care, dental care, proper diet, and parents' time.

Several additional pieces of evidence underline the robustness of the above finding. The relative magnitude of the effect of mother's schooling on oral health, measured by the number of decayed permanent teeth in adolescence, is not altered when the periodontal index, a proxy for genetic oral health endowment, is held constant. When oral health is examined in a longitudinal context, mother's schooling dominates father's schooling in the determination of the periodontal index in adolescence, with the periodontal index in childhood held constant. Similar comments apply to the effect of mother's schooling on school absence due to illness in adolescence (with school absence due to illness in childhood held constant) and to the effect of mother's schooling on obesity in adolescence (with obesity in childhood held constant).

The identification of plausible mechanisms via which mother's schooling influences children's health has increased our confidence that the impact of schooling represents a behavioral effect as opposed to a genetic effect or a statistical artifact. Children of highly educated mothers come from small families and are likely to have seen a dentist for preventive reasons in the past year. In turn, family size is negatively related to several measures of adolescent health, and preventive care is positively related to oral health. Another mechanism is that cognitive development in childhood has a positive effect on health in adolescence, and cognitive development is positively related to mother's schooling.

To summarize, we have evidence that nurture as opposed to nature plays an important role in the health of children and youths and that the effect of mother's schooling is behavioral as opposed to genetic. Thus public policies aimed at children's health must try to offset the problems encountered by children of mothers with low levels of schooling; in particular, they should try to improve the skills of uneducated mothers in their capacity as the main provider of health care for their children.

2. Impacts of Preventive Care and Health Manpower

With regard to the role of preventive dental care, youths who received a preventive dental check-up within the past year and youths exposed to fluoridated water have much better oral health than other

youths. Moreover, the probability of a preventive examination is positively related to the number of dentists per capita in a youth's county of residence. This implies that a program to increase the availability of dentists in medically deprived areas would improve the oral health of youths in these areas. Indeed, we estimate that the payoffs to increasing dental manpower by one per thousand population are about the same as the payoffs to the coverage of preventive dental care under national health insurance.

The probability of obtaining a preventive check-up by a doctor is also positively related to family income and to the number of pediatricians per capita in the county of residence. But we have little evidence that preventive care delivered to youths by physicians is efficacious in terms of their physical health. Therefore, the payoffs to national health insurance for physicians' services delivered to youths or programs to increase the availability of doctors who treat youths are very small.

Overall, what these results suggest is that selective rather than general programs would be most effective in improving the health of the population under 18 years of age. For instance, instead of providing complete coverage for physicians services delivered to persons from birth to age 18 under national health insurance, the government should direct its attention at prenatal care and physicians services during the first year of life. It is known that appropriate prenatal and infant care can make a difference in terms of health outcomes. Conversely, our results for oral health suggest that the payoffs to the coverage of dental care from the age it is first received until age 18 or beyond would be substantial.

3. Income and Race Differences in Children's Health

We show that when health measures from mid-childhood are the subject of analysis, both income and race differences are much less pronounced than they are in infant mortality and birth weight data. We do find differences in the health status of black and white children and of children from high and low income families, but these differences by no means overwhelmingly favor the white or high-income children. With respect to differences by race, whether or not they are adjusted for differences in associated socioeconomic factors, black children in many cases are in better health than their white counterparts. In the case of income differences in health, the high income children do appear to be in better health according to most measures, but their advantage is greatly diminished when one controls for related socioeconomic factors like parents' educational attainment. These findings imply that policies that aim to improve the well-being of children via income transfers, such as those advocated by the recent Carnegie Council on Children would have, at best, very small effects on health.

4. Multidimensional Nature of Children's Health

Our findings highlight the necessity of explicitly recognizing the multidimensional nature of health. For example, poor and black children are in worse health when traditional health measures are used, but they tend to be in better health when aspects of the new morbidity are under study. Such fine distinctions are hidden when a single index like infant or childhood mortality is used. These results underscore the importance of treating children's health status as multidimensional and illustrate how the use of a single health index could lead to erroneous conclusions about health status and its relation to income and race.

5. Diet, Growth, and Family Background

Average nutrient intakes of infants and young children are well above recommended dietary standards. Moreover, nutrient intakes for children in households of lower economic status are very similar to intakes of children in households of higher economic status. Rates of children's growth are also similar in these households.

There are substantial effects of protein intakes on children's height and head growth, even though protein is consumed in excess of dietary standards. This finding and the apparent correlation between children's growth and their cognitive development brings to question the adequacy of present protein standards. Could American mothers, who provide very high protein diets for their children in households at all levels of socioeconomic status know more about what constitutes an adequate diet for their children than the experts do?

In general family income and parents' schooling have statistically significant but very small positive effects on the nutrient (calories and protein) intakes of young children. Hence, we have little evidence that intakes of calories and proteins are mechanisms via which family background affects the growth of young children. Indeed, when nutrition is not held constant, the impact of family background on height, weight, and head circumference are very small.